

ABSTRACT

Respirable particulate matter (PM) is associated with harmful cardiopulmonary effects in humans. To test the hypothesis that individuals with certain susceptibility factors have heightened inflammatory and airway responses to PM exposure, a single-blind randomized dose crossover human study of controlled exposure to filtered air (FA), and concentrated ambient particles (CAPS) was conducted. We enrolled 10 mild- moderate asthmatic GSTM1 null subjects, 10 mild- moderate asthmatic GSTM1 present subjects and 10 healthy GSTM1 present subjects to determine the short-term effects of CAPS exposure in individuals likely to be at risk for adverse effects. Outcome measures included symptom scores, physiologic measures (vital signs, spirometry, exhaled nitric oxide, heart rate variability) as well as serum, sputum, and nasal lavage samples for inflammatory biomarkers. Particle mass concentrations averaged $187\mu\text{g}/\text{m}^3$ for CAPS and $35\mu\text{g}/\text{m}^3$ for FA during the 2-hour exposures. During both CAPS and FA exposures, GSTM1-null asthmatics reported increased symptom scores while decreased systolic blood pressure was observed in all groups. Mean exhaled nitric oxide concentration (FeNO) was increased immediately after CAPS exposure compared to FA for all subjects. Sputum total cell counts trended higher after CAPS than after FA exposures and nasal lavage IgG4 was increased after CAPS and decreased after FA exposure for the entire population. Heart rate variability (HRV) data demonstrated increased heart rate and decreased HRV post-exposure across all groups regardless of exposure conditions (CAPS or FA). CAPS exposure and susceptibility group showed minimal effects on HRV changes. Overall, a few endpoints supported the hypothesis of increased airway inflammation with CAPS exposure. However, the results did not demonstrate an effect of asthma or GSTM1 status on the inflammatory response to CAPS.